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Western Ecological Research Center http://www.werc.usgs.gov

Using Parasites to Monitor Ecosystem Health

Although we tend to concentrate on the problems posed by infectious disease, parasites can play a positive role in ecosystems. The USGS Western Ecological Research Center is working with the Channel Islands National Park in California to better understand how bacterial epidemics can protect kelp forests from overgrazing by sea urchins and how parasitic castrators might be used against invasive crabs.

In new research funded by the Environmental Protection Agency, USGS researchers will develop monitoring tools that use parasites to evaluate the health of salt marshes. Parasites may be affected by the biodiversity of the community of hosts that they inhabit. Depending on the impact and particular parasite studied, environmental degradation may either increase or decrease parasitism. In some cases, a high diversity and abundance of parasites may indicate a healthy ecosystem by reflecting high abundances of diverse hosts connected by multiple trophic interactions.

How healthy is this estuary? Photo: K. Lafferty.

Questions to be addressed:

- How do we assess the health of complex ecosystems?
- Do healthy estuaries ironically support more trematode parasites than unhealthy ones?
- Are parasitic ciliates indicators of stressed fishes?

Trematodes, or flukes, that occur in salt marshes are parasites with complex life cycles involving fishes, invertebrates, birds and mammals. If one of the hosts in a trematode's life cycle is missing, that trematode will not be able to persist. A measure of the trematode community, gathered from dissecting snails that act as the first host, provides a single, integrated snapshot of the hosts that have been in an estuary over the average life-span of the snails that occur there. Such a single measure of ecosystem integrity would otherwise be impossible to obtain, due to the complexities of gathering comprehensive data on fishes, invertebrates and birds.

This technique has already proven useful in assessing the success of habitat restoration at Carpinteria Salt Marsh in California. Trematode parasites increase dramatically after degraded areas are restored. Researchers will now test this technique at several west-coast estuaries, including pristine sites in Baja California, Mexico, where it is predicted that trematodes will be abundant and diverse relative to the heavily degraded estuaries in southern California.

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